

Curriculum Vitae — Nicholas C. Borchering

Nicholas C. Borchering, MD PhD

Contact

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Positions

- **Clinical Assistant Professor of Pathology and Immunology**, Washington University in St. Louis (2024-07–Present) — St. Louis, MO
- **Head of Computational Biology**, Omniscope (2023-07–2024-06) — Barcelona, Spain
- **Senior Computational Biologist**, Santa Ana Bio (2022-01–2023-06) — Alameda, CA

Education & Training

Education

- M.D., Medicine, Carver College of Medicine, University of Iowa, 2020
- Ph.D., Cancer Biology, Carver College of Medicine, University of Iowa, 2020
- M.S., Pathology, University of Iowa, 2014
- B.S., Nutritional Sciences (summa cum laude), Iowa State University, 2012

Postgraduate Training

- Fellow, Histocompatibility and Immunogenetics, Washington University School of Medicine (2024-07–Present)
- Resident, Clinical Pathology, Washington University School of Medicine (2020-07–2023-05)

Professional Licensure

- 2023: Medical License, Missouri, #2022049785 (Active)

Military Experience

- U.S. Marine Corps, Sergeant (2007-05–2013-05), Retired

Consulting & Advisory

- **Development Consultant**, Columbus Instruments, Columbus, OH (2024-12–Present)
- **Scientific Advisor**, Epana Bio, Inc, San Francisco, CA (2024-12–Present)

Editorial & Peer Review

Editorial/Review Boards - Human Immunology (2025)

Guest Editor - Viruses (2025)

Ad Hoc Reviews - Cancer Discovery - Human Immunology - Journal of Immunology - Journal of Open Source Software - Journal of Transplantation - Nucleic Acids Research - Nucleic Acids Research: Genomics & Bioinformatics - Nature Machine Intelligence - Nature Communications - PLoS - PLoS Computational Biology - Science Advances - Science Immunology

Service & Committees

Institutional

- Residency Recruitment Committee, Department of Pathology and Immunology, Washington University St Louis. (2025–Present)
- Faculty Search Committee, Department of Pathology and Immunology, Washington University St Louis. (2024–Present)
- Alpha Omega Alpha Selection Committee, Carver College of Medicine, University of Iowa. (2019–2020)
- LCME Accreditation Review Taskforce, Carver College of Medicine, University of Iowa. (2016–2017)
- Medical Education Council, Carver College of Medicine, University of Iowa. (2016–2017)
- Presidential Charter Committee for Recreational Services, University of Iowa. (2015–2018)
- Research Council, University of Iowa (2014–2018)
- Graduate Student Senate, University of Iowa (2013–2014)

National

- Education Initiatives Committee, American Society for Histocompatibility and Immunogenetics (2024–Present)
- First Aid/USMLErx Student Council (2016–2017)

Mentorship

Research Mentorship

- Qile Yang, Undergraduate, 2023–Present: Computational immunology research resulting in two submitted publications
- Isabel Risch, MSTP Student, 2024–Present: HLA-B27 TCR profiling
- Patty Hernandez, Fellow, 2024–Present: HLA eplet comparison of commercial assays

Career Development

- Haewon Shin, Graduate Student, 2024–Present: Serving on thesis committee

Awards & Honors

- 2023: Emerging Generation Award, American Society for Clinical Investigation
- 2021: Paul E. Strandjord Young Investigator Award, Academy of Clinical and Laboratory Physicians and Scientists
- 2020: Williams L. Roberts Young Investigator Award with Distinction, Academy of Clinical and Laboratory Physicians and Scientists
- 2020: Special Achievement in Pathology, Iowa Pathology Society
- 2019: Alpha Omega Alpha Honor Medical Society, Carver College of Medicine, University of Iowa
- 2018: Hancher-Finkbine Medallion, University of Iowa
- 2018: Wilderness Medicine Race, Carver College of Medicine, University of Iowa
- 2017: Richard G. Lynch, MD Award for Pathology Research, Carver College of Medicine, University of Iowa
- 2017: Cancer Center Research Award, Carver College of Medicine, University of Iowa
- 2017: Wilderness Medicine Race, Carver College of Medicine, University of Iowa
- 2015: ProQuest Hall of Scholars
- 2015: L.B. Sims Outstanding Master's Thesis Award in Biological Sciences, Graduate College, University of Iowa
- 2015: Richard G. Lynch, MD Award for Pathology Research, Carver College of Medicine, University of Iowa
- 2014: Richard G. Lynch, MD Award for Pathology Research, Carver College of Medicine, University of Iowa
- 2013: Cancer Center Research Award, Carver College of Medicine, University of Iowa
- 2012: Departmental Scholarly Achievement Award, Department of Food Science and Human Nutrition, Iowa State University
- 2012: University Graduation Marshall, Iowa State University
- 2012: Graduation Ceremony Student Address, Department of Human Sciences, Iowa State University

- 2005: **Eagle Scout, Boy Scouts of America**

Professional Memberships

- Member, Siteman Cancer Center at Barnes-Jewish Hospital (2025–Present)
- Member, Antibody Society (2025–Present)
- Member, Academy of Clinical Laboratory Physicians and Scientists (2024–Present)
- Member, American Society for Histocompatibility and Immunogenetics (2024–Present)
- Member, American Board of Pathology (2023–Present)
- Member, Alpha Omega Alpha Honor Society (2019–Present)

Software

- **scRepertoire** (2020) — Author. Toolkit for single-cell immune repertoire analysis and visualization
- **escape** (2020) — Author. Easy single cell analysis platform for enrichment
- **Trex** (2023) — Author. T-cell receptor embedding and sequence analysis
- **Ibex** (2023) — Author. B-cell receptor embedding and sequence analysis
- **immApex** (2024) — Author. Tools for Adaptive Immune Receptor Sequence-Based Machine and Deep Learning
- **immReferent** (2025) — Author. Reference interface to IMGT and OGRDB for immune receptor and HLA sequences
- **bHIVE** (2025) — Author. B-cell Hybrid Immune Virtual Evolution model for artificial immune system simulation
- **dandelionR** (2025) — Author. Single-cell immune repertoire trajectory analysis in R

Research Funding

Institutional - 2025-2026: *Identification of novel alloantibody targets in lung transplant recipients using phage display immunoprecipitation and sequencing* — Interdivision Translational Research Department of Pathology, Washington University. Role: **Principal Investigator** - 2022-2023: *Measuring intercellular mitochondria transfer with single-cell sequencing* — Interdivision Translational Research Department of Pathology, Washington University. Role: **Co-Investigator** - 2017: *Targeting mismatch repair for immunotherapy in basal-like breast cancer* — Oberley Seed Grant for Experimental Therapeutics. Role: **Co-PI**

National - 2025-: *Harnessing Single-Cell T Cell-Receptor Sequencing to Accelerate Diagnosis in Inflammatory Arthritis* — Arthritis Research Program Focused Research Award, Department of Defense. Role: **Co-Investigator** - 2017-2020: *Paracrine non-canonical Wnt signaling in breast cancer* — NIH F30 CA206255. Role: **Principal Investigator** - 2015-2016: *Paracrine non-canonical Wnt signaling in breast cancer* — American Medical Association Foundation Research Seed Grant. Role: **Principal Investigator**

Invited Presentations

Institutional - 2025: *Computational approaches to the immune synapse*. Rheumatology Grand Rounds, Washington University in St. Louis, MO - 2023: *Single-cell characterization of the T follicular immune response in COVID-19 vaccination using deep learning*. Physician-Scientist Symposium, St. Louis, MO - 2023: *Transcriptional heterogeneity in cancer-associated regulatory T cells is predictive of survival*. Single-Cell RNA Sequencing Symposium, Iowa Institute of Genetics

National - 2025: *AI for predicting the specificity of TCR*. ASHI Annual Meeting, Orlando FL - 2025: *Bridging Biology and Bytes: The World of Computational Immunology*. Department of Immunology Grand Rounds, Mayo Clinic, Rochester MN - 2023: *Single-cell characterization of the T follicular immune response in COVID-19 vaccination using deep learning*. Single Cell Club Montreal Meeting - 2020: *Single-cell mRNA sequencing of murine and human alopecia areata identifies immune cell profiles predictive of human disease state*. Academy of Clinical Laboratory Physicians and Scientists Meeting, Iowa City IA - 2019: *Single-cell profiling of cutaneous T-cell lymphoma reveals heterogeneity associated with disease progression*. Society for Investigative Dermatology Meeting, Chicago IL - 2016: *Paracrine regulation of breast cancer tumorigenesis*. Midwestern Association of Graduate Schools Conference, Chicago IL

Conference Abstracts

- 2025: O., Martens, G., Taniguchi, M., & Liu, C.. *A Robust AUC-Based Method for Eplet Calling in HLA Single Antigen Bead Assays: Reducing Variability and Enhancing Cohort-Level Profiling*. Histocompatibility and Immunogenetics Annual Meeting
- 2025: O., Dajles, A., Martens, G., Clark, D., Taniguchi, M., & Liu, C.. *Developing Flow Cytometry Crossmatch Thresholds: A Statistical Evaluation for Clinical Crossmatching Data*. Histocompatibility and Immunogenetics Annual Meeting
- 2024: Heyn, H., Melero, J., Deuner, G., Baraibar, I., Grzelak, M., Caratú, G., García-Durán, C., Grau, F., García-Illescas, D., Fariñas, L., Paula Nieto, P., Morabito, S., Rotem, A., Casbas-Hernandez, P., Gros, A., Tabernero, J., Oaknin, A., Nieto, J., O., & Élez, E.. *Liquid biopsy tracking of immunotherapy-induced T cell dynamics in MSS colorectal and endometrial tumors*. ESMO Congress Annual Meeting
- 2024: Melero, J., Sentís, I., Cebria-Xart, A., Caratu, G., Grzelak, M., Soto, M., Rodríguez-Hernández, C., Mendizabal-Sasieta, A., Maspero, D., Pascual, A., Perez, J., Galan, R., O., Nieto, J., Avgustinova, A., & Heyn, H.. *Spatio-temporal tracking of therapy-induced T cell immunity against pediatric rhabdoid tumors*. Innovations in Single Cell Omics
- 2024: Melero, J., Grzelak, M., Pravdyvets, D., Soto, M., Mendizabal-Sasieta, A., Perron, U., O., & Heyn, H.. *Ultra deep single-cell T cell receptor sequencing for cancer therapeutics and prognosis*. LSX World Congress Annual Meeting
- 2024: Melero, J., Colom-Sanmartí, B., Mendizabal-Sasieta, A., Perron, U., Grzelak, M., Pravdyvets, D., Soto, M., Nieto, J., Vidal, S., Tejpar, S., O., Planas-Rigol, E., & Heyn, H.. *Integrated modeling of T cell repertoires to identify clonotype signatures of ICI response*. Immuno-Oncology Summit Europe

- 2024: Planas-Rigol, E., Melero, J., Colom-Sanmartí, B., Bonfill-Teixidor, E., Arias, A., Grzelak, M., Pravdyvets, D., Sant, M., Martelotto, L., O., Heyn, H., & Seoane, J.. *Quantification of Brain Metastasis-Infiltrating T cells in Blood Using Ultra-Deep Single-Cell T Cell Repertoire Sequencing*. American Association for Cancer Research Annual Meeting
- 2023: Melero, J., Colom-Sanmartí, B., Mendizabal-Sasieta, A., Perron, U., Grzelak, M., Pravdyvets, D., Soto, M., Nieto, J., Vidal, S., Tejpar, S., O., Planas-Rigol, E., & Heyn, H.. *Integrated modeling of T cell repertoires to identify clonotype signatures of ICI response*. ESMO Immuno-Oncology Congress
- 2023: O., Jia, W., Giwa, R., Field, R.L., Moley, J.R., Kopecky, B., Chan, M., Yang, B., Sabio, J., Walker, E., Osorio, O., Bredemeyer, A., Pietka, T., Alexander-Brett, J., Morley, S.C., Artyomov, M., Abumrad, N., Schilling, J., Lavine, K., Crewe, C., & Brestoff, J.R.. *Dietary lipids inhibit mitochondria transfer to macrophages to divert adipocyte-derived mitochondria into the blood*. American Society for Clinical Investigation Annual Meeting
- 2023: O., Leckie-Harre, A., Wu, H., Humphreys, B., & Malone, A.. *Autoencoder, a Novel Computational Tool to Score T Cell Clones Demonstrates Biopsy T Cell Clones Are Not Represented in Peripheral Blood*. American Transplant Congress Annual Meeting
- 2021: Lasrado, N., O., Arugmugam, R., Starr, T.K., & Reddy, J.. *Dissecting the complexity of heart infiltrates in post-infectious myocarditis induced with CVB3 infection by single-cell RNA sequencing analysis*. American Association of Immunologists Annual Meeting
- 2021: O., Henderson, N., Ortolan, L., Liu, V., Link, B.K., Mangold, A., & Jabbari, A.. *Comprehensive transcriptional and clonotypic analysis of peripheral blood in Sezary syndrome reveals novel expression markers and shifting gene profiles associated with treatment*. Society for Investigative Dermatology Annual Meeting
- 2021: O., Henderson, N., Ortolan, L., Liu, V., Link, B.K., Mangold, A., & Jabbari, A.. *Comprehensive transcriptional and clonotypic analysis of peripheral blood in Sezary syndrome reveals novel expression markers and shifting gene profiles associated with treatment*. United States and Canada Academy of Pathology Annual Meeting
- 2020: O.. *Combining single-cell and AIRR data*. Adaptive Immune Receptor Repertoire Society Annual Meeting
- 2020: Rauckhorst, A.J., O., Kraus, A.S., Scerbo, D., & Taylor, E.B.. *Preserving the in vivo metabolome and energy-sensitive phosphoproteome requires rapid freezing of tissue samples*. Metabolomics Association of North America Annual Meeting
- 2020: O., Crotts, S., Ortolan, L., Bormann, N., & Jabbari, A.. *Single-cell mRNA sequencing of murine and human alopecia areata identifies immune cell profiles predictive of human disease state*. Academy of Clinical Laboratory Physicians and Scientists Annual Meeting, Iowa City, IA
- 2020: Renavikar, P., Sinha, S., Brate, A., Crawford, M., O., Steward, S., & Karandikar, N.. *Immune suppressive deficit in human Tc1 cells secondary to IL-12-induced pathways*. Academy of Clinical Laboratory Physicians and Scientists Annual Meeting, Iowa City, IA
- 2020: Hoffmann, D., Feagle, T., & O.. *Virtual Anatomy Videos for Pre-Lab Preparation: Does Usage Correlate with Grade Outcomes*. Experimental Biology Annual Meeting, San Diego, CA (Canceled due to COVID-19)
- 2020: Cole, K., Councilman, K., Zhang, W., & O.. *WNT/-Catenin Signaling Correlates with*

- Improved Survival in Luminal A Breast Cancer.* USCAP Annual Meeting, Los Angeles, CA
- 2019: Vishwakarma, A., O., Chementi, M., Vishwakarma, P., Nepple, K., Salem, A., Jenkins, R.W., Zhang, W., & Zakharia, Y.. *Mapping immune landscape in clear cell renal carcinoma by single-cell genomics.* AACR Special Conference on Tumor Immunology and Immunotherapy, Boston, MA
 - 2019: O., Voigt, A., Liu, V., Link, B.K., Zhang, W., & Jabbari, A.. *Single-cell profiling of cutaneous T-cell lymphoma reveals underlying heterogeneity associated with disease progression.* Society for Investigative Dermatology Annual Meeting, Chicago, IL
 - 2018: O., Bormann, N., & Zhang, W.. *Using data analytics to predict and improve cancer immunotherapy response.* American Physician Scientist Association Midwest Regional Meeting, Iowa City, IA
 - 2017: O., Jo, S., & Zhang, W.. *Targeting mismatch repair for basal-like breast cancer.* Cancer Biology Training Consortium Annual Meeting, Portland, OR
 - 2017: Feagle, T., O., & Hoffmann, D.. *Students Prefer 3D Anatomy Videos for Prelab Preparation Compared to Traditional Resources and Usage is Related to Class Performance.* Experimental Biology Conference, Chicago, IL
 - 2017: Kolb, R., Kluz, P., Wei, T.Z., Bormann, N., O., Markan, K., Pothoff, B., Tan, N.S., Sutterwala, F., & Zhang, W.. *IL-1 promotes obesity-driven breast cancer progression through the upregulation of Angptl4 in adipocytes.* Inflammation-driven Cancer: Mechanisms to Therapy Keystone Symposia, Keystone, CO
 - 2016: Schaefer, K.A., Toral, M., Velez, G., Cox, A., Baker, S., O., Colgan, D.F., Smits, M.M., Bondada, V., Mashburn, C.B., Yu, C., Geddes, J., Tsang, S.H., Bassuk, A.G., & Mahajan, V.B.. *Calpain-5 expression in the retina localizes to photoreceptor synapses.* FASEB Conference on the Biology of Calpains in Health and Disease, Big Sky, MT
 - 2016: Kolb, R., Phan, L., O., Liu, Y., Yuan, F., Janowski, A.M., Xie, Q., Markan, K., Li, W., Pothoff, M., Fuentes-Mattei, E., Ellies, L., Knudson, M., Lee, M., Yeung, S., Cassel, S., Sutterwala, F., & Zhang, W.. *Obesity-induced Nlr4 inflammasome promotes angiogenesis in breast cancer.* AACR Special Conference: The Function of Tumor Microenvironment in Cancer, San Diego, CA
 - 2015: Kolb, R., O., Liu, Y., Yuan, F., Xie, Q., Sutterwala, F., & Zhang, W.. *NLR4 inflammasome promotes breast cancer progression in diet-induced obese mice.* American Association for Cancer Research Annual Meeting, Philadelphia, PA
 - 2015: O., Kusner, D., Kolb, R., Xie, Q., & Zhang, W.. *Paracrine Wnt5a signaling inhibits the expansion of tumor-initiating cells via Ryk/TGF R/Smad2.* ASCI/AAP/APSA Joint Meeting, Chicago, IL
 - 2014: O., Kusner, D., Kolb, R., Xie, Q., & Zhang, W.. *Wnt5a/ROR1 Axis in Triple Negative Breast Cancer Progression and Potential Therapy.* American Association for Cancer Research Annual Meeting, San Diego, CA
 - 2014: Kolb, R., Liu, Y., Xie, Q., O., Li, W., & Zhang, W.. *Inflammasome activation in obesity-associated breast cancer progression.* American Association for Cancer Research Annual Meeting, San Diego, CA
 - 2014: Xie, Q., O., Kolb, R., & Zhang, W.. *CD177, A novel metastasis suppressor of breast cancer.* American Association for Cancer Research Meeting, San Diego, CA

Publications

- Alam, Jehan, Ghasem Yazdanpanah, Rinki Ratnapriya, Nicholas Borcharding, Cintia S de Paiva, DeQuan Li, Rodrigo Guimaraes de Souza, Zhiyuan Yu, and Stephen C Pflugfelder. 2022. “[IL-17 Producing Lymphocytes Cause Dry Eye and Corneal Disease with Aging in RXR Mutant Mouse.](#)” *Frontiers in Medicine* 9: 849990.
- Alam, Jehan, Ghasem Yazdanpanah, Rinki Ratnapriya, Nicholas Borcharding, Cintia S de Paiva, DeQuan Li, and Stephen C Pflugfelder. 2022. “[Single-Cell Transcriptional Profiling of Murine Conjunctival Immune Cells Reveals Distinct Populations Expressing Homeostatic and Regulatory Genes.](#)” *Mucosal Immunology* 15 (4): 620–28.
- Amanat, Fatima, Mahima Thapa, Tinting Lei, Shaza M Sayed Ahmed, Daniel C Adelsberg, Juan Manuel Carreño, Shirin Strohmeier, et al. 2021. “[SARS-CoV-2 mRNA Vaccination Induces Functionally Diverse Antibodies to NTD, RBD, and S2.](#)” *Cell* 184 (15): 3936–3948.e10.
- Andreatta, Massimo, Paul Gueguen, Nicholas Borcharding, and Santiago J Carmona. 2023. “[T Cell Clonal Analysis Using Single-Cell RNA Sequencing and Reference Maps.](#)” *Bio-Protocol* 13 (16): e4735.
- Baer, John M, Chong Zuo, Liang-I Kang, Angela Alarcon de la Lastra, Nicholas C Borcharding, Brett L Knolhoff, Savannah J Bogner, et al. 2023. “[Fibrosis Induced by Resident Macrophages Has Divergent Roles in Pancreas Inflammatory Injury and PDAC.](#)” *Nature Immunology* 24 (9): 1443–57.
- Bi, Jianling, Shujie Yang, Long Li, Qun Dai, Nicholas Borcharding, Brett A Wagner, Garry R Buettner, et al. 2019. “[Metadherin Enhances Vulnerability of Cancer Cells to Ferroptosis.](#)” *Cell Death & Disease* 10 (10): 682.
- Borcharding, Nicholas, Nicholas L Bormann, and Gloria Kraus. 2020. “[scRepertoire: An r-Based Toolkit for Single-Cell Immune Receptor Analysis.](#)” *F1000Research* 9: 47.
- Borcharding, Nicholas, Nicholas Bormann, David Kusner, Ryan Kolb, and Weizhou Zhang. 2015. “[Transcriptome Analysis of Basal and Luminal Tumor-Initiating Cells in ErbB2-Driven Breast Cancer.](#)” *Genomics Data* 4: 119–22.
- Borcharding, Nicholas, and Jonathan R Brestoff. 2023. “[The Power and Potential of Mitochondria Transfer.](#)” *Nature* 623 (7986): 283–91.
- Borcharding, Nicholas, Kimberly Cole, Paige Kluz, Michael Jorgensen, Ryan Kolb, Andrew Bellizzi, and Weizhou Zhang. 2018. “[Re-Evaluating e-Cadherin and -Catenin: A Pan-Cancer Proteomic Approach with an Emphasis on Breast Cancer.](#)” *The American Journal of Pathology* 188 (8): 1910–20.
- Borcharding, Nicholas, Sydney B Crotts, Luana S Ortolan, Nicholas Henderson, Nicholas L Bormann, and Ali Jabbari. 2020. “[A Transcriptomic Map of Murine and Human Alopecia Areata.](#)” *JCI Insight* 5 (13).
- Borcharding, Nicholas, and Ann M Gronowski. 2021. “[Commentary on a Case of Unexpected Hyperglycemia.](#)” *Clinical Chemistry* 67 (8): 1060–61.
- Borcharding, Nicholas, Yogesh Jethava, and Praveen Vikas. 2020. “[Repurposing Anti-Cancer Drugs for COVID-19 Treatment.](#)” *Drug Design, Development and Therapy* 14: 5045–58.
- Borcharding, Nicholas, Wentong Jia, Rocky Giwa, Rachael L Field, John R Moley, Benjamin J Kopecky, Mandy M Chan, et al. 2022. “[Dietary Lipids Inhibit Mitochondria Transfer to](#)

- Macrophages to Divert Adipocyte-Derived Mitochondria into the Blood.” *Cell Metabolism* 34 (10): 1499–1513.e8.
- Borcherding, Nicholas, Wooseob Kim, Michael Quinn, Fangjie Han, Julian Q Zhou, Alexandria J Sturtz, Aaron J Schmitz, et al. 2024. “CD4⁺ t Cells Exhibit Distinct Transcriptional Phenotypes in the Lymph Nodes and Blood Following mRNA Vaccination in Humans.” *Nature Immunology* 25 (9): 1731–41.
- Borcherding, Nicholas, Ryan Kolb, Jodi Gullicksrud, Praveen Vikas, Yuwen Zhu, and Weizhou Zhang. 2018. “Keeping Tumors in Check: A Mechanistic Review of Clinical Response and Resistance to Immune Checkpoint Blockade in Cancer.” *Journal of Molecular Biology* 430 (14): 2014–29.
- Borcherding, Nicholas, David Kusner, Ryan Kolb, Qing Xie, Wei Li, Fang Yuan, Gabriel Velez, Ryan Askeland, Ronald J Weigel, and Weizhou Zhang. 2015. “Paracrine WNT5A Signaling Inhibits Expansion of Tumor-Initiating Cells.” *Cancer Research* 75 (10): 1972–82.
- Borcherding, Nicholas, David Kusner, Guang-Hui Liu, and Weizhou Zhang. 2014. “ROR1, an Embryonic Protein with an Emerging Role in Cancer Biology.” *Protein & Cell* 5 (7): 496–502.
- Borcherding, Nicholas, Kevin J Severson, Nicholas Henderson, Luana S Ortolan, Allison C Rosenthal, Andrew M Bellizzi, Vincent Liu, Brian K Link, Aaron R Mangold, and Ali Jabbari. 2023. “Single-Cell Analysis of Sézary Syndrome Reveals Novel Markers and Shifting Gene Profiles Associated with Treatment.” *Blood Advances* 7 (3): 321–35.
- Borcherding, Nicholas, Ajaykumar Vishwakarma, Andrew P Voigt, Andrew Bellizzi, Jacob Kaplan, Kenneth Nepple, Aliasger K Salem, Russell W Jenkins, Yousef Zakharia, and Weizhou Zhang. 2021. “Mapping the Immune Environment in Clear Cell Renal Carcinoma by Single-Cell Genomics.” *Communications Biology* 4 (1): 122.
- Borcherding, Nicholas, Andrew P Voigt, Vincent Liu, Brian K Link, Weizhou Zhang, and Ali Jabbari. 2019. “Single-Cell Profiling of Cutaneous t-Cell Lymphoma Reveals Underlying Heterogeneity Associated with Disease Progression.” *Clinical Cancer Research: An Official Journal of the American Association for Cancer Research* 25 (10): 2996–3005.
- Cheng, Yinwen, Nicholas Borcherding, Ayomide Ogunsakin, Caitlin D Lemke-Miltner, Katherine N Gibson-Corley, Anand Rajan, Allen B Choi, et al. 2021. “The Anti-Tumor Effects of Cetuximab in Combination with VTX-2337 Are t Cell Dependent.” *Scientific Reports* 11 (1): 1535.
- Corvino, Dillon, Martin Batstone, Brett G M Hughes, Tim Kempchen, Susanna S Ng, Nazhifah Salim, Franziska Schneppenheim, et al. 2025. “Type i Interferon Drives a Cellular State Inert to TCR-Stimulation and Could Impede Effective t-Cell Differentiation in Cancer.” *European Journal of Immunology* 55 (1): e202451371.
- Crawford, Michael P, Nicholas Borcherding, and Nitin J Karandikar. 2023. “IL-17 Cytokines Preferentially Act on Naïve CD4⁺ t Cells with the IL-17AF Heterodimer Inducing the Greatest Functional Changes.” *PloS One* 18 (4): e0285166.
- Crawford, Michael P, Sushmita Sinha, Pranav S Renavikar, Nicholas Borcherding, and Nitin J Karandikar. 2020. “CD4 t Cell-Intrinsic Role for the t Helper 17 Signature Cytokine IL-17: Effector Resistance to Immune Suppression.” *Proceedings of the National Academy of Sciences of the United States of America* 117 (32): 19408–14.
- Dong, Qianze, Yan Xiu, Yang Wang, Christina Hodgson, Nick Borcherding, Craig Jordan, Jane Buchanan, et al. 2022. “HSF1 Is a Driver of Leukemia Stem Cell Self-Renewal in Acute Myeloid

- Leukemia.” *Nature Communications* 13 (1): 6107.
- Fleagle, Timothy R, Nicholas C Borcharding, Jennie Harris, and Darren S Hoffmann. 2018. “Application of Flipped Classroom Pedagogy to the Human Gross Anatomy Laboratory: Student Preferences and Learning Outcomes.” *Anatomical Sciences Education* 11 (4): 385–96.
- Fujiwara, Yuki, Robert J Torphy, Yi Sun, Emily N Miller, Felix Ho, Nicholas Borcharding, Tuoqi Wu, et al. 2021. “The GPR171 Pathway Suppresses t Cell Activation and Limits Antitumor Immunity.” *Nature Communications* 12 (1): 5857.
- Gu, Vivian W, Edward Cho, Dakota T Thompson, Victoria C Cassady, Nicholas Borcharding, Kelsey E Koch, Vincent T Wu, et al. 2021. “AP-2 Is Required for Maintenance of Multipotent Mammary Stem Cells.” *Stem Cell Reports* 16 (1): 106–19.
- He, Mingyu, Kate Roussak, Feiyang Ma, Nicholas Borcharding, Vince Garin, Mike White, Charles Schutt, et al. 2023. “CD5 Expression by Dendritic Cells Directs t Cell Immunity and Sustains Immunotherapy Responses.” *Science (New York, N.Y.)* 379 (6633): eabg2752.
- Hernandez, Patricia V, Manli Shen, Mei San Tang, Michiko Taniguchi, Nicholas Borcharding, and Chang Liu. 2025. “Antigen and Eplet Coverage by Representative Solid-Phase Immunoassays for Anti-HLA Antibody Screen.” *Human Immunology* 86 (4): 111339.
- Herzog, Brett H, John M Baer, Nicholas Borcharding, Natalie L Kingston, Jad I Belle, Brett L Knolhoff, Graham D Hogg, et al. 2023. “Tumor-Associated Fibrosis Impairs Immune Surveillance and Response to Immune Checkpoint Blockade in Non-Small Cell Lung Cancer.” *Science Translational Medicine* 15 (699): eadh8005.
- Irac, Sergio E, Megan Sioe Fei Soon, Nicholas Borcharding, and Zewen Kelvin Tuong. 2024. “Single-Cell Immune Repertoire Analysis.” *Nature Methods* 21 (5): 777–92.
- Kim, Myung-Chul, Nicholas Borcharding, Kawther K Ahmed, Andrew P Voigt, Ajaykumar Vishwakarma, Ryan Kolb, Paige N Kluz, et al. 2021. “CD177 Modulates the Function and Homeostasis of Tumor-Infiltrating Regulatory t Cells.” *Nature Communications* 12 (1): 5764.
- Kim, Myung-Chul, Nicholas Borcharding, Woo-Jin Song, Ryan Kolb, and Weizhou Zhang. 2024. “Leveraging Single-Cell Transcriptomic Data to Uncover Immune Suppressive Cancer Cell Subsets in Triple-Negative Canine Breast Cancers.” *Frontiers in Veterinary Science* 11: 1434617.
- Kim, Myung-Chul, Umasankar De, Nicholas Borcharding, Lei Wang, Joon Paek, Indraneel Bhattacharyya, Qing Yu, et al. 2024. “Single-Cell Transcriptomics Unveil Profiles and Interplay of Immune Subsets in Rare Autoimmune Childhood Sjögren’s Disease.” *Communications Biology* 7 (1): 481.
- Kim, Myung-Chul, Zeng Jin, Ryan Kolb, Nicholas Borcharding, Jonathan Alexander Chatzkel, Sara Moscovita Falzarano, and Weizhou Zhang. 2021. “Updates on Immunotherapy and Immune Landscape in Renal Clear Cell Carcinoma.” *Cancers* 13 (22).
- Kluz, Paige N, Ryan Kolb, Qing Xie, Nicholas Borcharding, Qi Liu, Yuewan Luo, Myung-Chul Kim, et al. 2020. “Cancer Cell-Intrinsic Function of CD177 in Attenuating -Catenin Signaling.” *Oncogene* 39 (14): 2877–89.
- Kolb, H Ryan, Nicholas Borcharding, and Weizhou Zhang. 2021. “Understanding and Targeting Human Cancer Regulatory t Cells to Improve Therapy.” *Advances in Experimental Medicine and Biology* 1278: 229–56.
- Kolb, Ryan, Umasankar De, Sajid Khan, Yuewan Luo, Myung-Chul Kim, Haijun Yu, Chaoyan Wu, et al. 2021. “Proteolysis-Targeting Chimera Against BCL-x_l Destroys Tumor-

- Infiltrating Regulatory t Cells.” *Nature Communications* 12 (1): 1281.
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